



Materials Engineering Branch

TIP*



No. 019 Electroless Nickel Plating Problems

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Electroless nickel (Kanigen¹) plating is often used on spacecraft hardware to provide a hard wear resistant surface. The plating is applied by chemical deposition so that atomic hydrogen is not released to cause hydrogen embrittlement. This nickel coating is much harder than the pure nickel coating applied by electro-deposition and also less ductile due to its phosphorus content.

Even though this process does not produce much hydrogen, there is enough generated to embrittle high strength steel, $R_c > 33$. Electroless nickel-plated high strength steel should be baked within 4 hours of removal from the plating bath to eliminate the dissolved hydrogen.

As a result of its brittleness, the electroless nickel coating should not be applied to flexible substrates that will be required to flex because the nickel coating will crack. It is then possible that a galvanic corrosion cell will be set up through the cracks between the nickel and the substrate metal, such as on electronic device leads, causing failure of the substrate.

If electroless plated parts are to be exposed to high temperatures, it is important to remember that nickel and phosphorus form a eutectic with a melting point of 880°C.

¹ The name Kanigan is derived from catalytic nickel generation. This patented process was developed by U.S. General Transportation in 1953.